

What is claimed is:

1 1. A signal chain for an image sensor, comprising:
2 a plurality of photo sensing elements;
3 a plurality of pixel readout circuits, each pixel readout
4 circuit operating to receive a charge-induced signal and a reset
5 signal from a photo sensing element, and to compute a difference
6 signal between said charge-induced signal and said reset signal,
7 said difference signal being measured with respect to a reference
8 signal; and

9 an amplifier configured to receive said reference signal,
10 and to supply said reference signal to said plurality of pixel
11 readout circuits during computation of said difference signal,
12 where said amplifier amplifies said difference signal when the
13 computation is completed.

14 2. The signal chain of claim 1, further comprising:
15 a plurality of A-to-D converters operating to alternately
16 convert said amplified difference signal.

17 3. The signal chain of claim 2, wherein each of said
18 plurality of A-to-D converters includes a binary-scaled capacitor
19 network capable of sampling and converting said reference signal
20 to a digital value.

1 4. The signal chain of claim 3, wherein said each of said
2 plurality of A-to-D converters includes a latch to save the
3 converted difference signal.

1 5. The signal chain of claim 3, wherein said plurality of
2 A-to-D converters includes:

3 a first A-to-D converter arranged into a first configuration
4 operating to convert said amplified difference signal in a
5 particular cycle; and

6 a second A-to-D converter arranged into a second
configuration operating to sample a next amplified difference
signal into said binary scaled capacitor network in said
particular cycle,

 wherein said first and said second A-to-D converters switch
configurations in a cycle after said particular cycle.

1 6. The signal chain of claim 2, further comprising:
2 a multiplexer configured to sequentially output saved
3 difference signal in said latch.

1 7. The signal chain of claim 1, wherein said plurality of
2 photo sensing elements is a pixel array arranged in columns of
3 pixels.

1 8. The signal chain of claim 1, wherein said each pixel
2 readout circuit includes at least two capacitive elements, one to
3 hold pixel reset value, and another to compute and store said
4 difference signal between said charge-induced signal and said
5 reset signal.

1 9. The signal chain of claim 1, wherein said amplifier
2 includes a feedback switch operating to provide said reference
3 signal, received at a negative input to said amplifier, to said
4 each pixel readout circuit through a feedback.

10. The signal chain of claim 1, wherein said each pixel
readout circuit includes a column select switch to connect
selected column pixel readout to said amplifier.

11. The signal chain of claim 10, wherein said column
select switch is a p-channel MOSFET (PMOS) transistor.

1 12. The signal chain of claim 1, wherein said each pixel
2 readout circuit includes a sample and hold switch to sequentially
3 read said charge-induced signal and said reset signal.

1 13. The signal chain of claim 12, wherein said sample and
2 hold switch is an n-channel MOSFET (NMOS) transistor.

1 14. The signal chain of claim 1, further comprising:
2 a sample and hold circuit coupled to said reference signal,
3 said sample and hold circuit operating to provide stable
4 reference signal.

1 15. The signal chain of claim 14, wherein said signal
2 smoothing circuit includes:
3 a reference signal generator operating to generate the
4 reference signal;

5 at least one switch configured to sample and hold the
reference signal at a certain level; and

a capacitor coupled to said at least one switch, said
capacitor operating to hold the sampled value at the certain
level.

16. The signal chain of claim 15, wherein said reference
signal generator includes a voltage divider resistor network.

1 17. The signal chain of claim 15, wherein said at least one
2 switch includes MOSFET transistors.

1 18. An image sensor output circuit, comprising:
2 a pixel array having a series of pixels, and operating to
3 receive optical data and convert said optical data into
4 electrical signals;
5 readout circuits configured to read said electrical signals
6 from said series of pixels with respect to a reference signal;
7 an amplifier configured to provide said reference signal
8 while said readout circuit is reading said electrical signal, and
9 to provide amplification of said referenced electrical signals
10 when the reading is done; and
11 at least one A-to-D converter operating to provide
12 conversion of said amplified electrical signal.

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21. An image sensor comprising:

- a pixel array having a plurality of pixels;
- a plurality of pixel readout circuits, each pixel readout circuit operating to receive a charge-induced signal and a reset signal from a pixel of said pixel array, and to compute a difference signal between said charge-induced signal and said reset signal, said difference signal being measured with respect to a reference signal;
- an amplifier coupled to said each pixel readout circuit, said amplifier configured to supply said reference signal during computation of said difference signal, and to amplify said difference signal when the computation is done;
- a pixel array addressing circuit configured to select a group of pixels in said pixel array to readout; and
- a controller coupled to said pixel array addressing circuit, and operating to provide selection control to said pixel array addressing circuit.